

REPORT DOCUMENTATION PAGE

*Form Approved
OMB No. 0704-0188*

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.

1. REPORT DATE (DD-MM-YYYY) 27-03-2003			2. REPORT TYPE Technical Abstract	3. DATES COVERED (From - To)	
4. TITLE AND SUBTITLE Progress in the Parallelization of the SOCRATES-P Missile Plume Code			5a. CONTRACT NUMBER		
			5b. GRANT NUMBER		
			5c. PROGRAM ELEMENT NUMBER		
6. AUTHOR(S) J.-L. Cambier, T. Smith, J. Cline, M. Braunstein, S. Chakravarthy			5d. PROJECT NUMBER 2304		
			5e. TASK NUMBER 0256		
			5f. WORK UNIT NUMBER		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)			8. PERFORMING ORGANIZATION REPORT NUMBER		
Air Force Research Laboratory (AFMC) AFRL/PRSA 10 E. Saturn Blvd. Edwards AFB, CA 93524-7680			AFRL-PR-ED-AB-2003-052		
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)			10. SPONSOR/MONITOR'S ACRONYM(S)		
			11. SPONSOR/MONITOR'S NUMBER(S) AFRL-PR-ED-AB-2003-052		
12. DISTRIBUTION / AVAILABILITY STATEMENT					
Approved for public release; distribution unlimited.					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
20030326 030					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT Unclassified	b. ABSTRACT Unclassified	c. THIS PAGE Unclassified	A		Sheila Benner 19b. TELEPHONE NUMBER (include area code) (661) 275-5963

FILE

MEMORANDUM FOR PRS (In-House Publication)

FROM: PROI (STINFO)

03 March 2003

Cambier
55676

Smith
55432

SUBJECT: Authorization for Release of Technical Information, Control Number: AFRL-PR-ED-~~PR~~-2003-052
J-L Cambier and T. Smith (AFRL/PRSA); J. Cline and M. Braunstein (Spectral Sciences Inc.); and S.
Chakravarthy (Metacomp Tech, Inc.), "Progress in the Parallelization of the SOCRATES-P Missile
Plume Code"

DoD HPCMP 2003 User Group Conference
(Bellevue, WA, 9 June 2003) (Deadline: 14 Mar 2003)

(Statement A)

AB

Progress in the Parallelization of the SOCRATES-P Missile Plume Code

J.-L. Cambier, T. Smith
Air Force Research Laboratory/PRSA
Jean-luc.Cambier@edwards.af.mil

J. Cline, M. Braunstein
Spectral Sciences, Inc.
jcline@spectral.com

S. Chakravarthy
Metacomp Tech. Inc.
src@metacomptech.com

Abstract

We report progress in the implementation of a parallelized version of SOCRATES under HPCMP CHSSI Project CFD-10. Examples of the increased capabilities of the Pre-Alpha code are given, along with an overview of the software design approach.

1. Introduction.

SOCRATES is the DoD standard high altitude missile plume code, designed to predict the optical properties of a multi-species, chemically reacting, non-equilibrium gas flowfield surrounding a missile in high altitude flight. It is based on the computationally-intensive, statistical Direct Simulation Monte Carlo method. The nominal code is serial and is written in structured fortran77. Current analysis requirements make it imperative to transition the code to a parallel environment, while the need to support continual evolution of the code requires development of a more modern, maintainable, and modular software package.

2. Objective.

The nominal parallelization plan includes consideration of two distinct paradigms: a distributed version, and also a conventional domain-decomposition approach. Code modernization is made possible by conversion to a more object-oriented and modular fortran90 approach. Additionally, the basic capabilities of the code are being improved.

3. Methodology.

The evolution of SOCRATES into SOCRATES-P involves the incremental replacement of datastructures, routines, and modules, along with the addition of new features. A working version of the nominal code is maintained at all times during the development.

4. Results.

The project will be undergoing Alpha test review during the third quarter of FY2003, with Beta test expected in FY2005. We present results for the scalability of the distributed version of the pre-alpha code on several HPC platforms, along with examples of the improved usability to appear in the code, such as automated volume grid-generation.

5. Significance.

The distributed parallel version of the Alpha code will be made available to interested users in FY2003. For a certain class of applications, this code will offer improved accuracy and computational efficiency, while retaining all features of the nominal, well-validated serial SOCRATES code currently available. The code will be hosted on a variety of HPC platforms. All versions of the code will be export-controlled.

DISTRIBUTION STATEMENT A
Approved for Public Release
Distribution Unlimited